

Investigation of Thermal Conductivity and Viscosity of Al₂O₃/PAG Nanolubricant for Application in Automotive Air Conditioning System

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ABSTRACT

In this paper, thermal conductivity and viscosity of the Al₂O₃/polyalkylene glycol (PAG) 46 nanolubricants for 0.05 to 1.0% volume concentrations at temperatures of 303.15 to 353.15 K have been investigated. Al₂O₃ nanoparticles were dispersed in the PAG lubricant by a two step preparation. The measurement of thermal conductivity and viscosity was performed using KD2 Pro Thermal Properties Analyzer and LVDV-III Rheometer, respectively. The results showed that the thermal conductivity of the nanolubricants increased by concentration, but decreased by temperature. Besides, the viscosity of the nanolubricants sharply increased for concentrations higher than 0.3%. However, this parameter diminished by temperature. The highest thermal conductivity and viscosity ratio were observed to be 1.04 and 7.58 times greater than the PAG lubricant for 1.0% and 0.4% concentrations, respectively. As a conclusion, it was recommended to use the Al₂O₃/PAG nanolubricants with concentration of less than 0.3% for application in automotive air conditioning system.

KEYWORDS: Nanolubricants; Thermal conductivity; Viscosity; Air conditioning system

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